Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

REVIEWS.

The Lafayette Formation. By W. J. McGEE. Twelfth Annual Report of the U. S. Geological Survey, pp. 347-521, 5 maps, 5 plates, 45 text cuts.

THIS brochure almost opens a new chapter in geological history; for although the formation is essentially a surface feature over an area of 100,000 square miles, and only thinly-covered by a mantle of Columbia sands extending over another 150,000 miles, yet the knowledge of these deposits was fragmentary, and they were not correlated as a unit—or interpreted in their bearing on the physical history of the continent, until the appearance of this work.[1] The investigation of the formation was commenced in Mississippi by Professor E. W. Hilgard, who gave it the above name, though the later appellation of "Orange Sand," given by Professor J. M. Safford, in Tennessee, was commonly accepted. Subsequently, McGee's researches along the Atlantic border made known the Appomattox formation, which the author afterwards found to be a northern continuation of Hilgard's Lafayette, or the "Orange Sand." Confusion also arose in the application of the latter name, and by consent of all the authors, Hilgard's original name was adopted.

The report is written in a narrative form in only a few chapters, which are unfortunately not sufficiently subdivided under topical headings to make the arrangement most favorable as a work of reference. On the other hand, the set of maps is particularly clear and explanatory of the text.

"The Lafayette formation may briefly be described as an extensive sheet of loams, clays, and sands of prevailing orange hues, generally massive above, generally stratified below, with local accumulations of gravel along the water-ways", (p. 489). The physical structure is peculiar, although the deposit resembles certain residuary clays derived from the Archean, and from lower Paleozoic limestones, from which it is not always easily distinguished when the gravels are absent, while the gravels may resemble those of the sometimes-underlying Potomac, or Tuscaloosa series. Again, the physical features of the whole formation are often reproduced in the overlying Columbia formation. Although the Lafayette is remarkably persistent in its characters over the enormous area, yet care must be exercised in its study. In exposed sections, the surfaces become case-hardened, and stand as vertical walls, on which often the shades of ferruginous oxidation can be seen. The subjacent formations give rise to local variations in the amount of sand, clay, or calcareous matter, which is particularly shown in the agricultural features. This formation once covered the entire coastal plain of both the Atlantic and Gulf margins from Maryland to Mexico, and extended up the Mississippi embayment as far as the mouth of the Ohio, covering a belt extending from the sea margin 50 to 200, or even 500 miles into the interior of the continent. Often, the deposits form only a thin mantle, and away from the valleys ten or twenty feet may be regarded as an average thickness. In the valleys, the accumulations reach 120 feet, and toward the mouth of the Mississippi, 200 feet or more. But the formation has been degraded to an enormous extent by erosion, which has removed it from broad areas, leaving only patches to mark its former extension.

---

[1] The author had published several advance notices prior to the appearance of the present report.

In an introductory chapter, the author has given us an excellent description of the physiography of the coastal plain and of the various geological series in contact with the Lafayette formation. On the Atlantic border, the interior of the coastal plain is sharply defined by the margin of the Piedmont plateau, generally characterized by Archean rocks. This margin is the "fall line," or location of the last great rapids in the descent of the rivers to the sea. Below this line, the streams, which generally cross the plains, are more or less navigable. The interior margin of the Gulf coastal plain is less sharply defined, as it trends across the termination of many different formations of varying characteristics. This same coastal plain extends seaward to the margin of the continental shelf, which is now submerged and extends far seaward of the present coast.

The geology of this plain presents a varied study. Generally speaking, the Potomac (or Tuscaloosa) or later Cretaceous deposits form the interior margin of the belt. This basement is succeeded by many stages of the higher Cretaceous, Eocene, and Miocene accumulations, although the succession is not everywhere complete. No marine fossils higher than the middle Miocene are known on the coastal plain, except at two or three localities. The topography of all of these formations was greatly modified by erosion during intervening periods of high level of the land, but in general, the successive formations were planed nearly to base level before the succeeding deposits were laid down. This was the condition before the Lafayette epoch, and the seaward slope of the country was more gradual than at present, although the continent was high enough to allow the submerged continental shelf to be a sub-aërial plain. Then came the extensive subsidence and seaward tilting, which allowed the invasion of oceanic waters over the coastal plain, so as to permit of the deposition of the loams even upon the margin of the Piedmont plateau. This subsidence was unequal, least in the region of Cape Hatteras, greater along the South Carolina axis, again diminished in the Gulf region, and greatest along the Rio Grande. The author regards all of these Lafayette deposits as having accumulated at sea level from the land wash brought down by the rivers. Although devoid of marine life, so far as known, this seems the most rational explanation, although the physical characters are very different from those of the earlier Tertiary or Mesozoic deposits, which were laid down after submergence with less decided seaward tilting.

Mr. McGee regards the duration of the epoch of subsidence as short. The succeeding elevation, which carried the country from 100 to 1,000 feet above tide, he regards as much longer. This uplift was not uniform, probably only 100-300 feet at Cape Hatteras, and 1,000 feet at the mouth of the Mississippi, but in undulations such as characterized the previous subsidence; where the greatest depression had taken place, there the greatest elevation followed along the same axes. Moreover, it is apparent from the intensity of erosion that the elevation was greater along the Appalachian and Cumberland plateaus than along the coast, giving greater slope to the rivers than at present. This elevation was unquestionably of long duration and the erosion enormous, removing from the valleys a large proportion of the accumulations of the preceding epochs and cutting through them to depths of 150 feet and upward, and to widths of 10 and 20 miles, even 100 miles in the case of the Mississippi. This the author emphasizes, giving great prominence to the geomorphy from which the post-Lafayette elevation is deduced.

After this long-continued period of degradation, the continent subsided, but not so much as during the Lafayette days, and during this subsidence the Columbia formation was deposited. Some of its characters are similar to those of the Lafayette, and indeed the latter deposit may often be mistaken for the earlier, where unconformity is not apparent. The Columbia formation covered the lower half of the coastal plain, and partly filled the great valleys which thus became estuaries. These deposits form the "second bottoms" of many of the coastal rivers, particularly on the Gulf slope. In short, the Columbia formation of the South is largely the Lafayette made over, though in the North its materials grade into those of the glacial period.

Following the Columbia submergence the continental margin again rose, even to an altitude above that of modern times, to such an extent as to permit of the clearing out of the valleys to a considerable extent; including those now submerged along the oceanic plateau. Then followed a subsidence to modern conditions. This post-Columbia elevation did not last nearly so long as the post-Lafayette, for 90 per cent. of the accumulations still remain.

The altitudes at which the Lafayette deposits are now found vary. In Maryland they occur at 500 feet; southward they decline so that at Hatteras they occur at 100–200 feet. Along the axis of greatest oscillation in South Carolina the formation rises to 800 feet, but again descends southward so that north of Mobile Bay they rise only 500 feet above tide. Again in Illinois and Arkansas, the loams rise to only 350 and 250, whilst they culminate at 1,000 feet along the Rio Grande. But as river terraces of the streams emptying into the Lafayette sea, the reviewer has met with the extension of the formation in the southern Appalachian at 1,500 to 2,000 feet, thus supporting the author's conclusions as to the greater magnitude of terrestrial undulation in the mountain regions than along the coast.

At Cape Hatteras, the Columbia deposits now rise only 25 feet above tide, but they increase to 300 feet in altitude to the north and again southward, so that in South Carolina they rise to 650 feet. Again they decline to 25 feet above the Gulf in Mobile Bay. Farther southwestward their present elevation is from 100 to 200 feet.

The meager flora of the Lafayette has both Cretaceous and Pleistocene features, and the more meager fauna represents the entire Neocene. The Columbia is regarded as the earliest Pleistocene, and the Lafayette as the later Pliocene, though the author groups it with the Miocene and small areas of marine Pliocene, the whole making the American Neocene. Its biological relations are not known; it is by its physical characters that the Lafayette formation has been investigated and largely explained.

The author of "The Lafayette Formation" has made one of the most important recent contributions to geological science. Besides his contribution to the geology of an enormous area, the principles of geomorphy are emphasized, and the interpretation of the continental changes of the later Tertiary days are set forth in an original manner, forming one of the most interesting chapters in dynamical geology.

The maps are particularly worthy of attention. The first represents the physiography of the coastal plain, and its relations both with the higher land area and deeper oceanic depression. The next is a colored map showing the distribution of the Lafayette formation and the overlying Columbia. The third map shows the continental area during the Lafayette subsidence; it is both a topographical and hydrographical chart of the physical features of land and sea when 250,000 square miles of the southeastern part of the continent was submerged. It is of special interest. Then follows the topographical map of the high continent during the post-Lafayette elevation, when the continental region was expanded by 100,000 miles or more in excess of that of modern times. The last map shows the continental contraction during the Columbia period—and a very strange looking map it is with the land margin dissected by numerous estuaries, scores or hundreds of miles in length, resulting from the submergence of the great valleys of the south in connection with the tilting of the land toward the South Carolina axis of oscillation.

Although this work was commenced by others, yet the extension and digestion of the whole belongs to the author, and it is a remarkably meritorious work. But in the study of geomorphy, and of the most interesting continental changes, the work is almost entirely original. The whole forms one of the most complete, yet peculiar, chapters of American geology. This review is only sufficient to call attention to a very suggestive report in which, however, there are still some questions left open. The author is to be congratulated on having taken up such an important and interesting but little known subject, and for working it out to such a degree of completion.

J. W. SPENCER.